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FOREST STATISTICS FOR MINNESOTA 1953

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U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

UNIVERSITY FARM ——— ST. PAUL, MINNESOTA

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By

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Prepared Jointly By

Lake States Forest Experiment Station
M. B. Dickerman, Director
U. S. Department of Agriculture, Forest Service

and

Office of Iron Range Resources and Rehabilitation
Edward G. Bayuk, Commissioner
State of Minnesota

FOREWORD

The material presented in this report is based upon field inventories made during the period 1947-1953. A number of public agencies, private industries, and individuals contributed in one way or another to this undertaking. Principal agencies taking part in the survey were the Office of Iron Range Resources and Rehabilitation Commission, Minnesota Conservation Department, 16 northern counties, the Chippewa and Superior National Forests, Bureau of Indian Affairs, and the Lake States Forest Experiment Station. Private companies assisting were the Blandin Paper Company, the Minnesota and Ontario Paper Company, the Northwest Paper Company, and the Wood Conversion Company.

The authors of this report were primarily responsible for the planning, direction, and supervision of the entire survey, but a large number of individuals participated directly in the field and office work. The following were the principal participants:

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The survey program and the individual county reports were reviewed and guided by the following advisory committee:

Minnesota Forest Survey Committee

Victor J. Hultstrand, Chairman, Forest Region Rehabilitation Committee
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George Amidon, Minnesota and Ontario Paper Company
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Raymond J. Wood, Diamond Match Company
F. H. Kaufert, Forestry School, University of Minn.

The survey committee is open to any interested individuals.

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U. S. Department of Agriculture, Forest Service
Lake States Forest Experiment Station 1/

Station Paper No. 31 November 1954

FOREST STATISTICS FOR MINNESOTA

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Paul C. Guilkey, Bernard M. Granum, R. N. Cunningham 2/

SUMMARY OF FOREST SURVEY DATA

Area

Land Area		51,206,000 acres
Commercial Forest Land		18,098,000 acres
	Sawtimber	2,017,000 acres
	Poletimber	5,281,000 acres
	Seedlings and Saplings	6,317,000 acres
	Nonstocked	4,483,000 acres
Non-commercial Forest Land		1,246,000 acres
	Reserved (productive)	428,000 acres
	Unproductive	818,000 acres
Non-forest Land		31,862,000 acres

1/ Maintained at St. Paul 1, Minnesota, by the U. S. Department of Agriculture in cooperation with the University of Minnesota.

2/ Messrs. Guilkey and Cunningham are Research Foresters at the Lake States Forest Experiment Station; Mr. Granum is Forester at the Office of Iron Range Resources and Rehabilitation.

Volumes

	Softwoods	Hardwoods	Total
Sawtimber (million board feet)	5,039	7,499	12,538
Pulpwood [1/] (million cords)	24	23	47
Growing stock (million cubic feet)	2,829	4,406	7,235
All timber [2/] (million cubic feet)	2,910	6,029	8,939

1/ Total volume including both sawlog and pole material of jack pine, spruce, balsam fir, and poplar.

2/ Growing stock plus cull trees, salvable dead trees, and hardwood limbs.

Estimated Growth, Allowable Cut and Actual Cut

	Softwoods	Hardwoods	Total	Per Acre
	Million bd. ft.	Million bd. ft.	Million bd. ft.	Bd. ft.
Sawtimber:				
Net growth	328	460	788	44
Allowable cut	202	299	501	28
Actual cut 1952	138	124	262	14
	Million cu. ft.	Million cu. ft.	Million cu. ft.	Cu. ft.
Growing stock:				
Net growth	118	267	385	21
Allowable cut	84	150	234	13
Actual cut 1952	78	76	154	9

(The data indicate that more timber could be cut in Minnesota than was harvested in 1952. However, detailed study of the figures shows that much of the present surplus consists of tamarack, cedar, aspen and low-quality hardwoods. Where surplusses of pine, spruce-fir, and better hardwoods exist, they are mostly in sparse, inaccessible stands or in situations where logging will be difficult and costly).

Ownership

	Commercial forest land	Growing stock vol.	Timber cut 1952
	Thousand acres	Million cu. ft.	Million cu. ft.
National Forest	2,195	1,367	18.2
Indian	717	348	5.5
Other Federal	143	54	0.3
State	3,484	1,213	19.4
County and Municipal	3,619	1,070	11.9
Farm	4,881	1,992	98.9
Other Private	3,059	1,191	
All Owners	18,098	7,235	154.2

Wood-Using Industries

Number of plants in state	1,970
Value of forest products as cut (1952)	$42,552,000 1/
Employment - man-days	5,555,000
Annual needs (1952) of Minnesota primary wood-using industries - standard cords	1,215,000

1/ The Forest Industries Information Committee estimates the value of finished products made from these logs, cordwood, etc., at $162 million in 1952.

Output of forest products varies from year to year, and records of one year are not necessarily representative of a period. (However, 1952 was reasonably close to the average for recent years.)

INTRODUCTION

The McSweeney-McNary Forest Research Act of May 22, 1928 authorized the Secretary of Agriculture to make and keep current a survey of the nation's forest resources. In 1933 the Lake States Forest Experiment Station of the Forest Service, U. S. Department of Agriculture, initiated the first complete field inventory of the forest resources of Minnesota as a part of the nation-wide survey. The Minnesota survey was completed in 1936 and for the first time provided reasonably accurate data showing the area, volume, growth, and drain of forest resources.

By 1946 the earlier data needed bringing up to date and a cooperative survey was planned. The National Forest organizations, the Office of Indian Affairs, and the Minnesota Department of Conservation assumed responsibility for surveying public lands under their jurisdiction. The Lake States Forest Experiment Station and the Iron Range Resources and Rehabilitation Commission assumed responsibility for covering lands outside public forests. As the work progressed, individual counties and several private industries participated. The state job was completed in 1953. The Office of Iron Range Resources and Rehabilitation has published reports on 10 counties, and eventually will have detailed reports covering the entire state either by individual counties or groups of counties.

The following report is a brief resume of forest statistics for the state as a whole. It incorporates data collected by all of the cooperating agencies. Although several years have elapsed since some of the counties were surveyed, no adjustments have been made in the inventories. Generally speaking, annual changes caused by cutting and growth have been compensating.

Comparability of Two Surveys

The statistics from the current survey differ in some respects from estimates derived from the initial forest survey of 1933-1936. In making comparisons it is important to recognize and adjust for these.

1. Because of the complexity of the forest type pattern in Minnesota, and the lack of sharp distinction between types, area figures may not be entirely comparable. Line-plot surveys as were used in 1934-1936 tend to purify types more by omitting small openings and other variants of an acre or two, than do the mapping techniques used in the more recent survey. It seems probable, for example, that small pine clumps and very small spruce, balsam fir, and tamarack swamps which were represented proportionately in the earlier survey may have been absorbed in broader hardwood complexes in the resurvey mapping.

2. Different criteria have been used from time to time in estimating "reserved" and "nonproductive" forest land. The 1936 Survey made no deductions for reserved land. The recent practice has been to list as reserved forest land those areas completely removed from timber use. Resorts, summer home sites, military reservations (other than target areas), game refuges, etc., where some timber is cut however, are classified as commercial forest land. The 1936 Survey classified large acreages of swamp as nonproductive and much poor aspen and poor oak as "scrub". In the current survey, areas have not been classified as nonproductive forest land if they can be made productive by planting, or in a few instances by draining. Some swamp areas of low productivity and lacking any appreciable stocking of timber species, were excluded from the forest classification in the recent survey, thus reducing the overall forest area a few hundred thousand acres below earlier estimates.

3. The earlier survey was made when markets were poor and utilization less complete than in the post-war period. Thus, the definition of a merchantable tree was stricter than at present. Specifically, to be considered merchantable in 1936 an 18-inch or larger hardwood would need to have one good 16-foot No. 2 log or two 16-foot No. 3 logs to be considered merchantable. A tree below 18 inches would need to have an 8-foot No. 2 or a 16-foot No. 3 log. Now any tree with an acceptable log of any grade is tallied merchantable.

4. Offsetting this to some extent has been the elimination (by definition) of volume in 10-inch hardwoods from the sawtimber classification in the recent survey. This is especially important in aspen and paper birch.

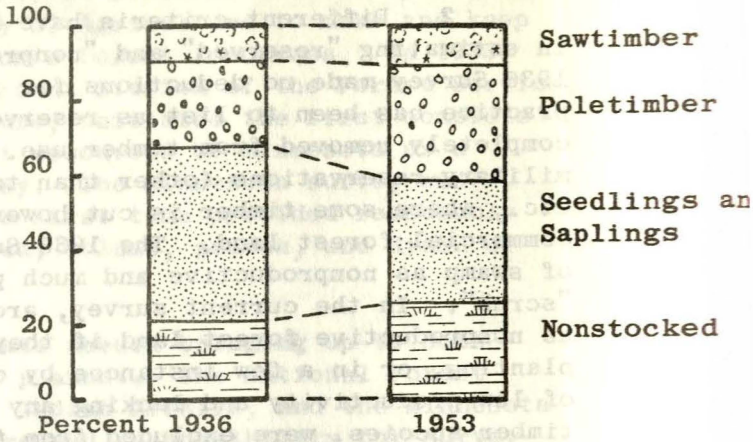
5. Limbwood of hardwood trees has been eliminated from the current inventory of cubic foot volumes of growing stock as well as from growth, allowable cut, and drain. This limbwood made up 16 percent of the total merchantable tree inventory in 1936.

By giving due recognition to the above differences it is possible to identify a number of trends in the timber resource situation from initial surveys to the resurvey 17 years later. The more important trends are summarized in the following section. The volume figures shown for 1936 have been adjusted as well as possible to conform with the standards of the 1953 data.

Area Comparisons

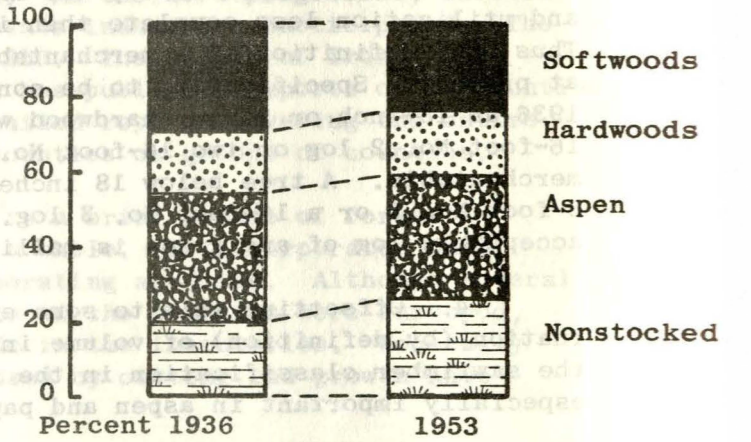
1. Size Classes.

The timber stands are more mature than 17 years ago. A larger proportion is in sawtimber and poletimber sizes; a smaller proportion is in the restocking class. The acreage of nonstocked land is larger than before.



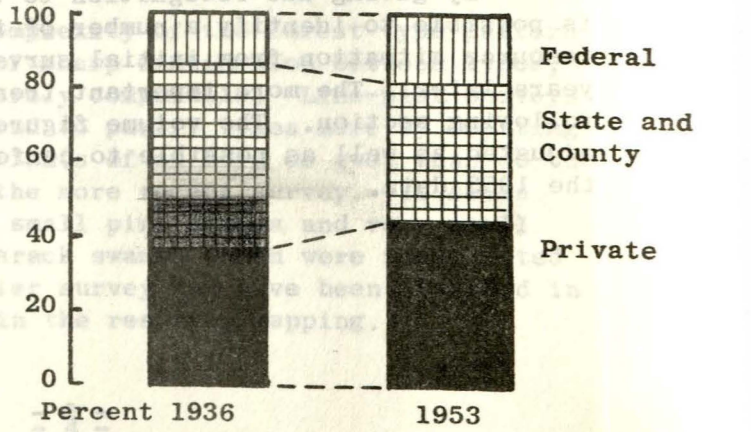
2. Cover Type Area.

The area in softwood types has shrunk somewhat. The hardwood type area including aspen, shows little net change.



3. Ownership.

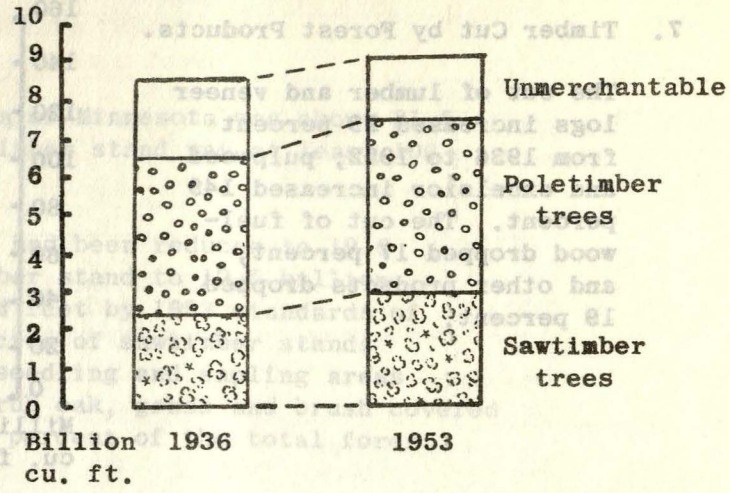
Public agencies now own 56 percent of the forest land as compared with 50 percent in 1936. The federal share has increased somewhat, while combined state and county ownership has declined slightly.



Volume Comparisons

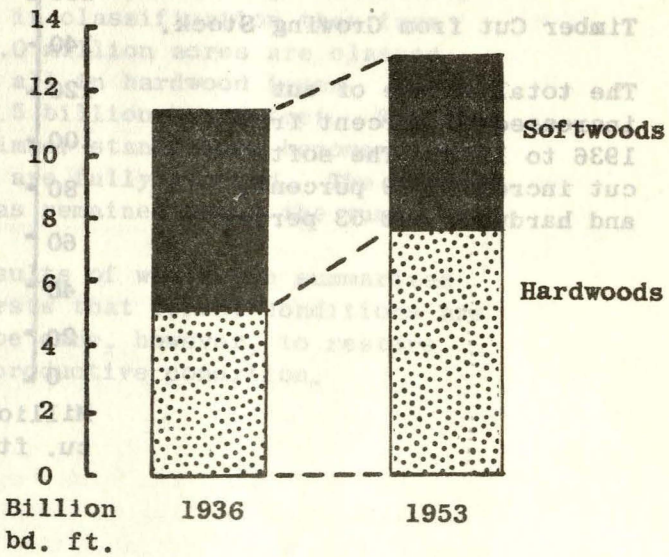
4. All Timber.

The cubic volume of standing timber in Minnesota has increased 6.4 percent since 1936. Sawtimber volume and poletimber volume have gone up 12.7 percent, but volume of hardwood limbs and cull trees has gone down 14 percent.



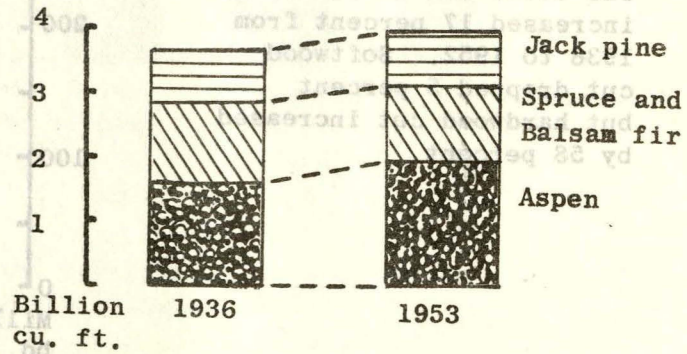
5. Sawtimber.

The 1953 sawtimber volume of all species is 11 percent greater than the adjusted estimate for 17 years ago, but the volume of softwood species has dropped 20 percent. Hardwood volume has increased 52 percent.



6. Pulpwood.

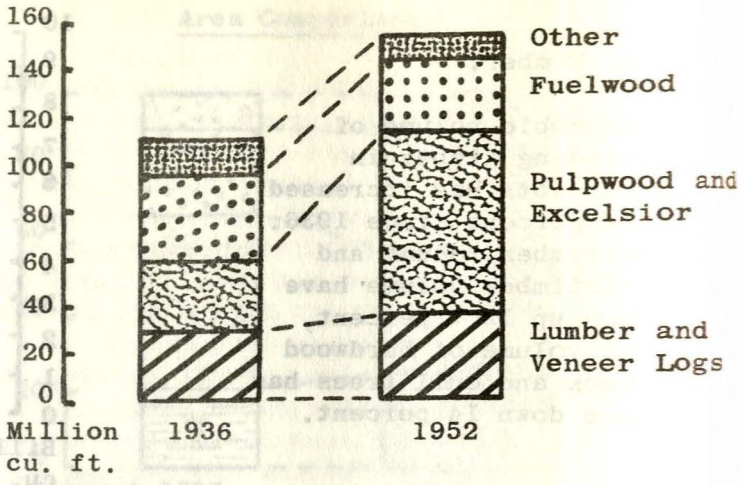
Softwood pulpwood volume, (jack pine, spruce and balsam fir), is 9 percent less than 17 years ago. Volume of aspen has increased about 23 percent.



Timber Cut Comparisons

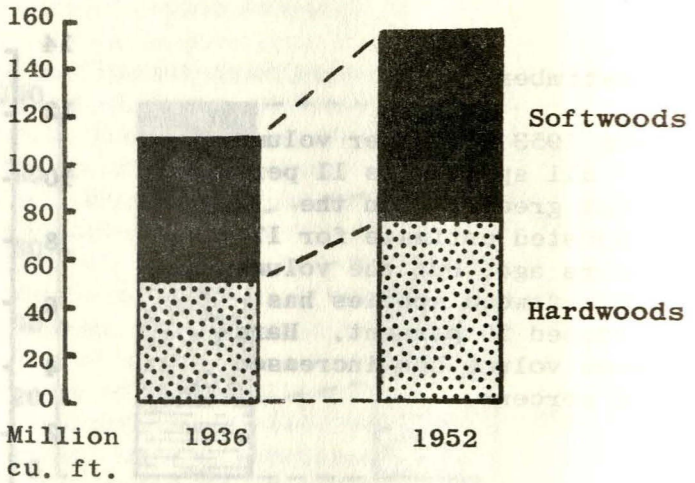
7. Timber Cut by Forest Products.

The cut of lumber and veneer logs increased 29 percent from 1936 to 1952; pulpwood and excelsior increased 149 percent. The cut of fuelwood dropped 17 percent, and other products dropped 19 percent.



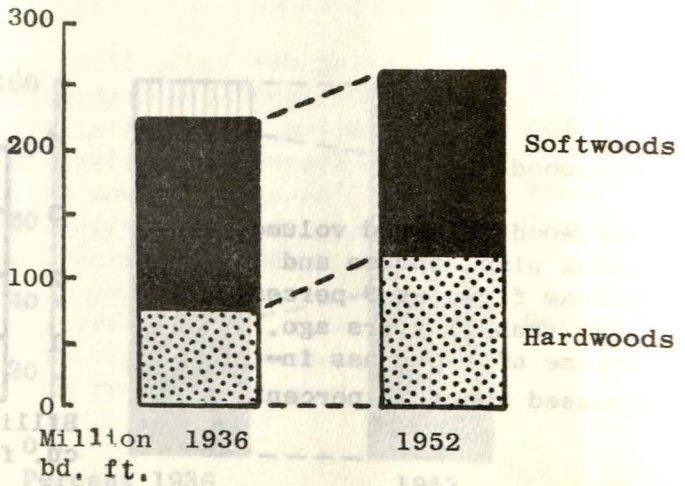
8. Timber Cut from Growing Stock.

The total volume of cut increased 40 percent from 1936 to 1952. The softwood cut increased 29 percent, and hardwood cut 53 percent.



9. Timber Cut from Sawtimber.

The total cut of sawtimber increased 17 percent from 1936 to 1952. Softwood cut dropped 5 percent but hardwood cut increased by 58 percent.



The original forest area of Minnesota was about 31.5 million acres; the original timber stand was at least 100 billion board feet.

By 1936 the forest area had been reduced to 19.6 million acres, and the sawtimber stand to 12.5 billion board feet (11.3 billion board feet by 1953 standards of measure.) Only 1.6 million acres of sawtimber stands remained. Most of the young seedling and sapling areas were understocked. Aspen, scrub oak, grass and brush covered 11.5 million acres, nearly 60 percent of the total forest area.

The surveys completed in 1953 indicate that the forest area is now about 19.3 million acres, the slight reduction coming more from differences in classification than from actual land clearing. Now 2.0 million acres are classed as sawtimber, the gain being all in hardwood types. The total sawtimber volume is 12.5 billion board feet. Seedling and sapling stands and poletimber stands have become considerably denser, though few are fully stocked. The acreage of aspen, grass, and brush has remained about the same.

The new survey, the results of which are summarized on the following pages, suggests that forest conditions are improving. Much remains to be done, however, to restore the forests to a reasonably productive condition.

Table 1. - Land Area, by Major Classes of Land - Minnesota, 1953

Class of Land	Area
	Thousand acres
Forest:	
Commercial	18,098
Noncommercial:	
Reserved (productive) 1/	428
Unproductive for timber use 2/	818
Total	19,344
Nonforest 3/	31,862
Total, all classes of land	51,206

1/ This is land in state parks, and federal and state recreational reserves, where cutting of timber is prohibited by law or regulations.

2/ This is poor swamp and other more or less wooded land judged incapable of producing merchantable pulpwood or sawtimber within 100 years. It includes 7,000 acres withdrawn for special uses.

3/ This includes 556,200 acres of small lakes, streams, etc. within areas classified as land by the Bureau of the Census.

Table 2. - Ownership of all land and commercial forest land by stand-size class - Minnesota, 1953

(In Thousand Acres)

Ownership class	All land	Commercial forest land				
		Total	Sawtbr. stands	Poletbr. stands	Seedling & sapling stands	Nonstocked and other area 1/
Federally owned or managed:						
National Forest	2,652	2,195	314	865	785	231
Indian	866	717	60	255	190	212
Bureau of Land Mgt.	93	49	2	13	15	19
Other	201	94	13	29	28	24
Total federal	3,812	3,055	389	1,162	1,018	486
State	5,028	3,484	202	967	1,178	1,137
County and municipal	4,799	3,619	146	985	1,585	903
Private:						
Farm	32,883	4,881	983	1,268	1,379	1,251
Industrial and other	4,684	3,059	297	899	1,157	706
All ownerships	51,206	18,098	2,017	5,281	6,317	4,483

1/ Includes areas not classified elsewhere.

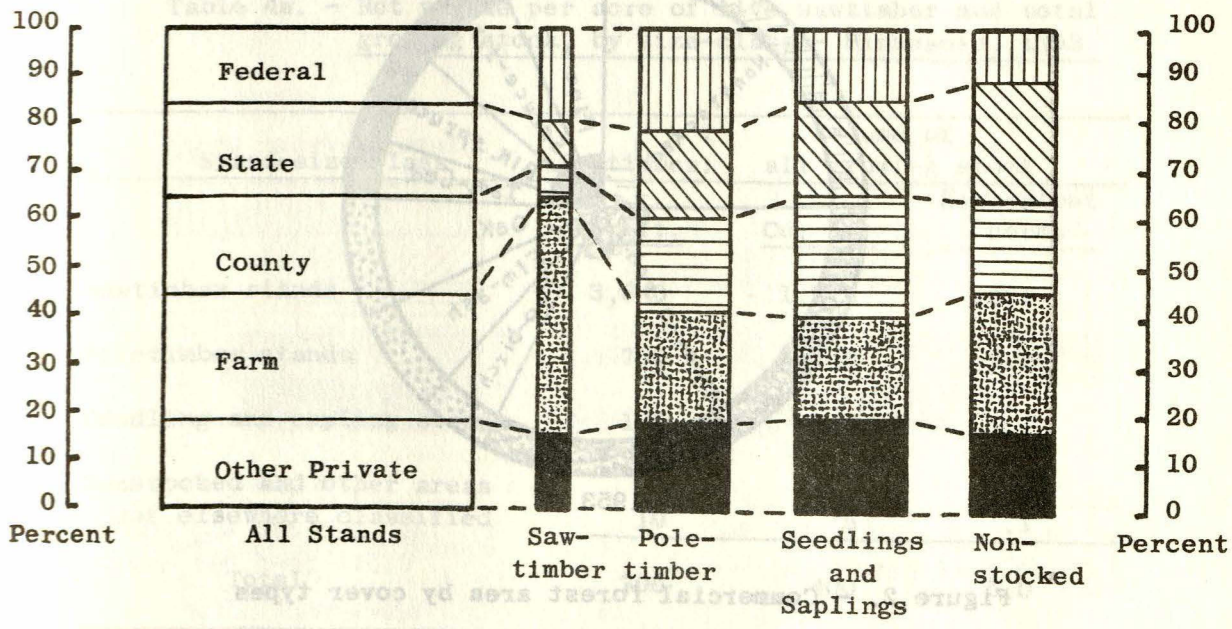
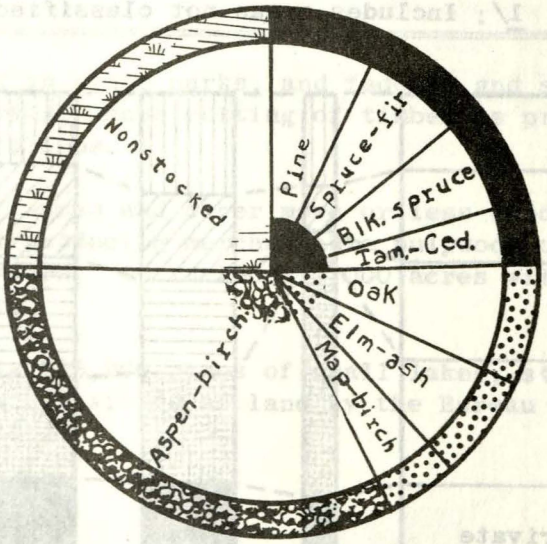


Figure 1. - Ownership of commercial forest land by stand-size class, in percent - Minnesota, 1953

Table 3. - Area of commercial forest land by major forest type and stand-size class - Minnesota, 1953

(In Thousand Acres)

Forest type	Total	Sawtimber stands	Poletimber stands	Seedling & sapling stands	Nonstocked
White and red pine	291	194	60	37	
Jack pine	986	199	447	340	
Spruce-fir	1,233	109	528	596	
Black spruce	1,170	8	468	694	
Tamarack	482	9	215	258	
Cedar	284	29	137	118	
Oak-hickory	1,182	493	420	269	
Elm-ash-cottonwood	1,144	411	480	253	
Maple-beech-birch	846	296	293	257	
Aspen-birch	5,997	269	2,233	3,495	
Nonstocked	4,483	-	-	-	4,483
Total	18,098	2,017	5,281	6,317	4,483



1953

Figure 2. - Commercial forest area by cover types

Table 4. - Net volume of live sawtimber and growing stock on commercial forest land, by size-class Minnesota - 1953

Stand-size class	1/ Sawtimber: Million bd. ft.	Total volume of all growing stock: Million cu. ft.	Equivalent thousand cds.
Sawtimber stands	7,735	2,445	30,600
Poletimber stands	3,973	3,891	48,600
Seedling and sapling stands	781	875	10,900
Nonstocked and other areas not elsewhere classified	49	24	300
Total	12,538	7,235	90,400

1/ All sawtimber volumes are in terms of the International 1/4-inch scale.

Table 4a. - Net volume per acre of live sawtimber and total growing stock, by size-class - Minnesota, 1953

Stand-size class	Sawtimber: Bd. ft.	Volume of all growing stock: Cu. ft.	Equivalent cords
Sawtimber stands	3,840	1,210	15.1
Poletimber stands	750	740	9.2
Seedling and sapling stands	120	140	1.7
Nonstocked and other areas not elsewhere classified	10	5	.1
Total	700	400	5.0

Table 5. - Net volume of live sawtimber and growing stock on commercial forest land, by ownership class - Minnesota, 1953

Ownership class	Sawtimber	Total volume of all growing stock	
	Million bd.ft.	Million cu.ft.	Equivalent thousand cds.
Federally owned or managed:			
National Forest	2,433	1,367	17,100
Indian	489	348	4,300
Bureau of Land Management	24	16	200
Other	66	38	500
Total	3,012	1,769	22,100
State	1,687	1,213	15,100
County or Municipal	1,391	1,070	13,400
Private:			
Farm	4,485	1,992	24,900
Industrial and Other	1,963	1,191	14,900
Total	6,448	3,183	39,800
All ownerships	12,538	7,235	90,400

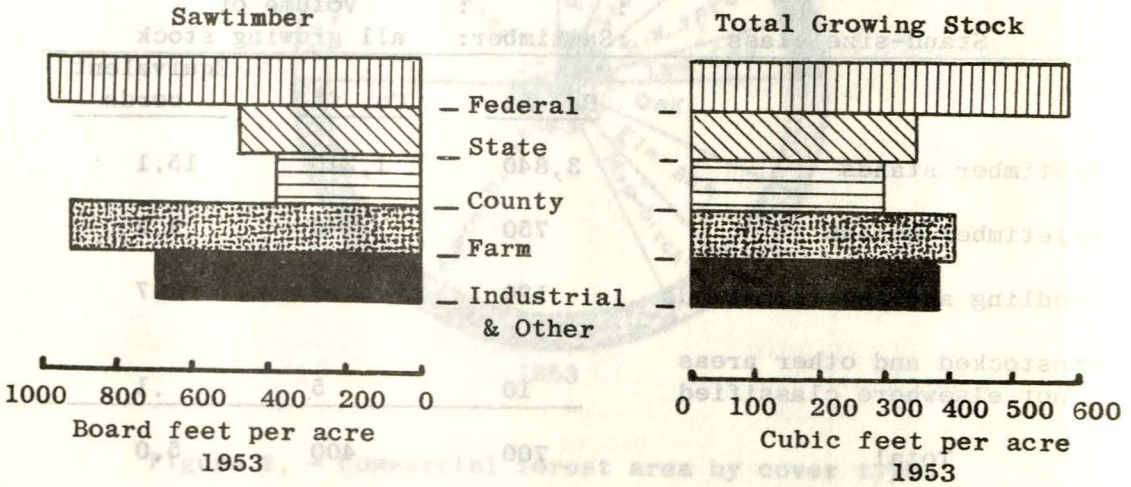


Figure 3. - Net volume per acre of live sawtimber and growing stocks on commercial forest land, by ownership class Minnesota - 1953

Table 6. - Net volume of live sawtimber and growing stock on commercial forest land, by species - Minnesota, 1953

Species	Sawtimber	Total volume of all growing stock	
	Million bd. ft.	Million cu. ft.	Equivalent thousand cds.
Softwoods:			
White and red pines	1,716	454	5,700
Jack pine	1,421	771	9,600
Spruce and balsam fir	1,340	1,172	14,600
Other eastern softwoods	562	432	5,400
Total softwoods	5,039	2,829	35,300
Hardwoods:			
White oak	174	69	900
Other white oaks	540	217	2,700
Red oak	1,218	484	6,000
Yellow birch	53	15	200
Sugar maple	261	124	1,500
Soft maple	104	45	600
Ash	462	306	3,800
Hickory	9	9	100
Cottonwood and aspen	1,927	1,862	23,300
Basswood	833	297	3,700
Black walnut	13	4	100
Other eastern hardwoods	1,905	974	12,200
Total hardwoods	7,499	4,406	55,100
All Species	12,538	7,235	90,400

Table 7. - Net volume of live sawtimber on commercial forest land by diameter class and species - Minnesota, 1953

(In Million Board Feet)

Species	9.0 to 10.9	11.0 to 12.9	13.0 to 14.9	15.0 to 16.9	17.0 to 18.9	19.0 and up	Total
Softwoods:							
White and red pines	272	378	310	200	155	401	1,716
Jack pine	631	498	221	57	12	2	1,421
Spruce and balsam fir	695	381	160	55	27	22	1,340
Other eastern softwoods	261	206	66	20	6	3	562
Total softwoods	1,859	1,463	757	332	200	428	5,039
Hardwoods:							
White oak	-	63	45	30	17	19	174
Other white oak	-	211	137	88	57	47	540
Red oak	-	405	341	222	129	121	1,218
Yellow birch	-	14	11	9	6	13	53
Sugar maple	-	80	60	43	30	48	261
Soft maple	-	21	19	24	14	26	104
Ash	-	195	116	70	36	45	462
Hickory	-	4	3	1	-	1	9
Cottonwood and aspen	-	1,029	425	188	92	193	1,927
Basswood	-	214	216	151	116	136	833
Black walnut	-	2	2	2	7	-	13
Other eastern hardwoods	-	621	392	284	193	415	1,905
Total hardwoods	-	2,859	1,767	1,112	697	1,064	7,499
All species	1,859	4,322	2,524	1,444	897	1,492	12,538

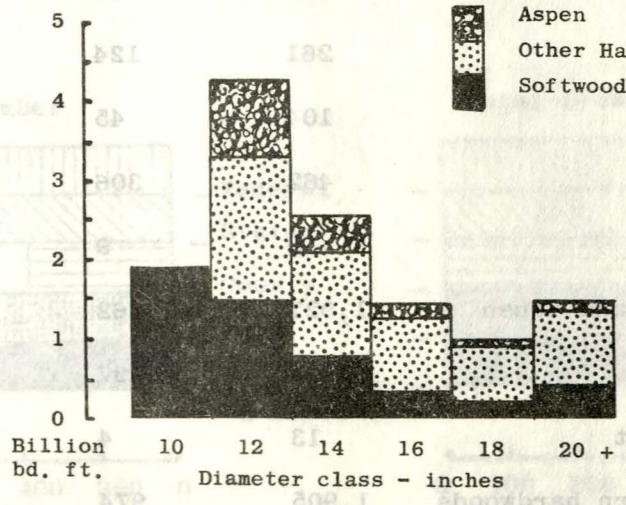


Figure 4. - Net volume of live sawtimber on commercial forest land by diameter class, for major species groups - Minnesota, 1953

Table 7a. - Number of trees by diameter class and species group - Minnesota, 1953 1/

(Million trees)

Diameter Class	Total	Softwoods	Hardwoods
Inches			
1.0 - 2.9	2,485	1,331	1,154
3.0 - 4.9	1,242	611	631
5.0 - 6.9	861	392	469
7.0 - 8.9	313	138	175
9.0 - 10.9	114	42	72
11.0 - 12.9	55	16	39
13.0 - 14.9	23	6	17
15.0 - 16.9	10	2	8
17.0 - 18.9	5	1	4
19.0 and up	2	1	1

1/ The number of 2-and 4-inch trees shown are those considered to be potential poletimber or sawtimber trees.

Table 8. - Net volume of all timber on commercial forest land by class of material and species group - Minnesota, 1953

(In Million Cu. Ft.)

Class of Material	Total	Softwoods	Hardwoods
Growing stock:			
Sawtimber trees:			
Sawlog portion	2,228	905	1,323
Upper stem portion	518	229	289
Total	2,746	1,134	1,612
Poletimber trees	4,489	1,695	2,794
Total growing stock	7,235	2,829	4,406
Other material:			
Sound cull trees	180	-	180
Rotten cull trees	1,073	77	996
Hardwood limbs	443	-	443
Salvable dead trees	8	4	4
Total other material	1,704	81	1,623
Total all timber	8,939	2,910	6,029

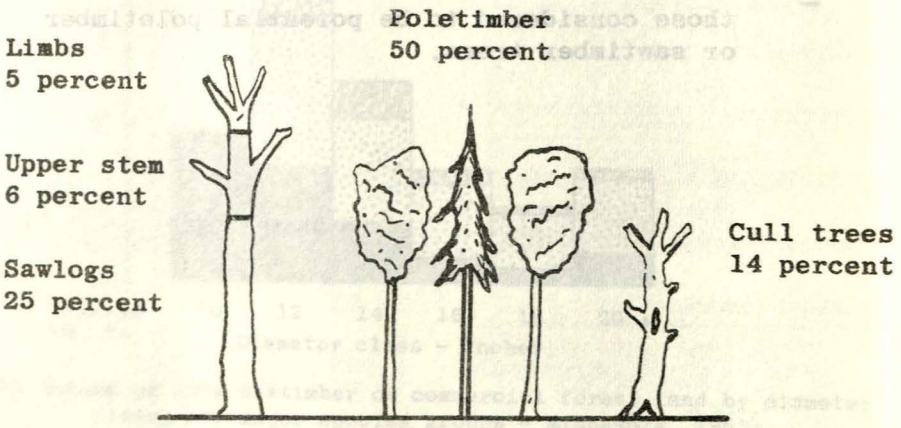


Figure 5. - Distribution of all timber on commercial forest land by class of material - Minnesota, 1953

Table 8a. - Net annual growth and mortality by species group - Minnesota, 1953

Species Group	Net annual growth 1/		Annual mortality 2/	
	Sawtimber	All growing stock	Sawtimber	All growing stock
	Million bd. ft.	Million cu. ft.	Million bd. ft.	Million cu. ft.
Softwoods:				
White, red and jack pine	151	30	52	28
Spruce and fir	135	66	26	29
Other softwoods	42	22	10	11
Total	328	118	88	68
Soft hardwoods:				
Aspen	170	147	42	59
Other soft hardwoods 3/	167	79	31	26
Total	337	226	73	85
Hard hardwoods 4/	123	41	33	20
All hardwoods	460	267	106	105
All species	788	385	194	173

1/ Preliminary - not adjusted for effect of logging, land clearing, or cultural operations. For most species the effect will be minor.

2/ Average loss of merchantable timber from fire, wind, insects, disease, etc. Any reduction in these losses by improved protection or increased salvage would be equivalent to increasing annual growth by the same amount.

3/ Includes soft maple, black ash, cottonwood, basswood, American elm, slippery elm, paper birch, balsam, poplar, willow, box elder, and other soft hardwoods.

4/ Includes oaks, yellow birch, sugar maple, hickory, black walnut, rock elm, white ash, green ash, butternut and other hard hardwoods.

Table 8b. - Annual mortality by cause and species group - Minnesota, 1953

Species group	Total	Fire	Insects	Disease	Other 1/
	Sawtimber - million board feet				
Softwood	88	2	5	15	66
Hardwood	106	2/	6	53	47
Total	194	2	11	68	113
	All growing stock - million cubic feet				
Softwood	68	1	4	12	51
Hardwood	105	2/	10	57	38
Total	173	1	14	69	89

1/ Principal "other" causes in order of importance are: (1) wind; (2) animal damage including browsing, trampling and damming of streams (beaver); (3) miscellaneous weather factors including sleet, sun-scald, drouth, snow breakage, frost killing.

2/ Less than one-half million board feet.

Table 8c. - Annual mortality by stand-size class - Minnesota, 1953

	Sawtimber	All growing stock	
	Million bd. ft.	Million cu. ft.	Equivalent thousand cds.
Sawtimber stands	120	47	590
Other stands	74	126	1,570
Total	194	173	2,160

Table 9. - Net annual growth, annual mortality, and timber cut of live sawtimber and growing stock on commercial forest land, by species groups - Minnesota, 1953

Item	Sawtimber			All growing stock		
	Total	Softwood	Hardwood	Total	Softwood	Hardwood
	Million bd. ft.	Million bd. ft.	Million bd. ft.	Million cu. ft.	Million cu. ft.	Million cu. ft.
Net annual growth 1/	788	328	460	385	118	267
Annual mortality	194	88	106	173	68	105
Timber cut:						
Timber products	252	133	119	140	72	68
Logging residue	10	5	5	14	6	8
Tot.timber cut 1/	262	138	124	154	78	76
Land clearing	5	2	3	6	1	5
Total	267	140	127	160	79	81
Allowable cut 1/	501	202	299	234	84	150

1/ The figures indicate that growth and allowable cut are larger than the 1952 rate of cutting and suggest justification for increasing the rate of harvest. Such increase will be appropriate, but to be constructive should be directed toward particular localities, particular species, and to some extent to particular ownerships. It should be guided by close study of resource statistics given in individual county reports.

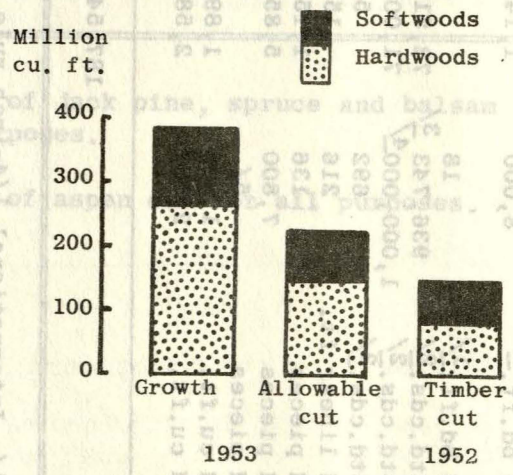


Figure 6. - Net annual growth, mortality, and timber cut of growing stock on commercial forest land, by species group - Minnesota, 1953

Table 10. - Output of timber products and annual cut of live sawtimber and growing stock - Minnesota, 1952

Timber product	Output of timber products					Annual cut of sawtimber			Annual cut of growing stock		
	Volume in standard units		Roundwood volume								
	Unit	Number	Total	Sftwd.	Hdwd.	Total	Sftwd.	Hdwd.	Total	Sftwd.	Hdwd.
			M cu.ft.	M cu.ft.	M cu.ft.	M bd.ft.	M bd.ft.	M bd.ft.	M cu.ft.	M cu.ft.	M cu.ft.
Sawlogs & sawbolts	M bd.ft. 1/	188,156	31,188	16,401	14,787	150,200	84,800	65,400	36,400	18,250	18,150
Veneer logs & bolts	M bd.ft. 1/	8,000	1,147	1	1,146	8,400	-	8,400	1,450	-	1,450
Coop. logs & bolts	M bd.ft. 1/	18	3	-	3	-	-	-	-	-	-
Pulpwood	Std.cds. 2/	936,743 3/	72,518	51,665	20,853	49,700	39,600	10,100	74,600	51,700	22,900
Fuelwood	Std.cds. 2/	1,000,000 4/	71,000	6,000	65,000	27,800	1,800	26,000	29,800	2,750	27,050
Excelsior	Std.cds. 2/	692	54	-	54	-	-	-	50	-	50
Piling	M linear ft.	216	152	152	-	1,200	1,200	-	200	200	-
Poles	M pieces	136	1,158	1,158	-	3,700	3,700	-	1,450	1,450	-
Posts	M pieces	7,800	5,850	1,970	3,880	4,700	1,600	3,100	5,000	1,600	3,400
Hewn ties	M pieces	5/	-	-	-	-	-	-	-	-	-
Mine timbers	M cu.ft.	1,893	1,893	1,725	168	4,700	4,000	700	1,800	1,600	200
Misc. 6/	M cu.ft.	2,582	2,582	370	2,212	11,300	1,400	9,900	3,450	450	3,000
Total			187,545	79,442	108,103	261,700	138,100	123,600	154,200	78,000	76,200

1/ International 1/4-inch rule.
2/ Rough wood basis.
3/ Volume of wood from mill residues used for pulp, negligible.
4/ Not including 11,707 thousand cubic feet of wood from mill residue used for domestic and industrial fuel.
5/ Negligible - included with miscellaneous products.
6/ Includes match and clothespin stock, hewn ties, cabin logs, lath, shingles, etc.

Table 11. - Timber cut on lands in different ownerships - Minnesota, 1952

Ownership	All timber		Sawtimber		Pulpwood	
	Soft-wood	Hard-wood	Soft-wood	Hard-wood	Soft-wood 1/	Hard-wood 2/
	Million cu. ft.		Million bd. ft.		Thousand cords	
National Forest	13.5	4.7	24.5	8.1	141	55
Indian	3.4	2.1	10.1	4.7	19	22
Other Federal	.1	.2	0.1	0.2	1	4
Total Federal	17.0	7.0	34.7	13.0	161	81
State	14.5	4.9	26.4	10.4	145	56
County and Municipal	8.7	3.2	9.7	7.5	97	37
Private	37.8	61.1	67.3	92.7	376	375
All Ownerships	78.0	76.2	138.1	123.6	779	549

1/ Volume of jack pine, spruce and balsam fir cut for all purposes.

2/ Volume of aspen cut for all purposes.

Table 12. - Comparison of 1936 and 1953 estimates of commercial forest area by stand-size class - Minnesota

(In thousand acres)

Stand-size class	1936		1953
	Original figure	Adjusted figure 1/	
Sawtimber	1,566	1,520	2,017
Poletimber	4,559	4,417	5,281
Seedling and Sapling:			
Good and medium stocking	4,704	4,106	4,646
Poorly restocked	4,663	4,289	1,671
Nonstocked	4,123	3,768	4,483
All Classes	19,615	18,100	18,098

1/ After removing certain reserved areas and nonproductive areas to bring in line with the 1953 definition of commercial forest area.

Table 13. - Comparison of 1936 and 1953 estimates of commercial forest area by type - Minnesota

(In thousand acres)

Forest Type	1936		1953
	Original figure	Adjusted figure 1/	
White and red pine	404	391	291
Jack pine	1,266	1,219	986
Spruce-fir	1,088	1,053	1,233
Black spruce	1,530	1,475	1,170
Tamarack	657	655	482
Cedar	380	378	284
All Softwood	5,325	5,171	4,446
Maple-beech-birch	894	886	846
Ash-elm-cottonwood	616	607	1,144
Oak-hickory (including scrub oak)	1,018	988	1,182
Aspen-birch (including scrub)	6,876	6,680	5,997
All Hardwood	9,404	9,161	9,169
Non-productive swamp	763	-	-
Nonstocked	4,123	3,768	4,483
All Types	19,615	18,100	18,098

1/ Adjusted to conform with 1953 definition of commercial forest area. Non-productive land excluded.

Table 14. - Approximate ownership of commercial forest land - Minnesota, 1936 and 1953

(In thousand acres)

Ownership	1936		1953
	Original figure	Adjusted figure 1/	
National Forest	1,299 2/	1,030	2,195
Other federal	836	600	860
State and County	8,244	7,500	7,103
Farm	4,827	4,730	4,881
Other private	4,409	4,240	3,059
Total	19,615	18,100	18,098

1/ Adjusted to conform with 1953 definition of commercial forest area.

2/ As of June 30, 1936. Large additional acreages were in the process of being acquired at the time.

Table 15. - Comparison of 1936 and 1953 estimates of growing stock (cubic feet and board feet) on commercial forest land by species - Minnesota

Species	All growing stock			Sawtimber		
	1936		1953	1936		1953
	Orig. figure	Adj.1/ figure		Orig. figure	Adj.1/ figure	
	Million cubic feet			Million board feet		
White-Red pine	583	562	454	2,597	2,360	1,716
Jack pine	1,034	983	771	2,263	2,010	1,421
Spruce	792	763	732	1,241	1,140	836
Balsam fir	384	379	440	350	330	504
Tamarack	121	121	218	137	130	167
Cedar	337	219	214	2/	330	395
All softwood	3,251	3,027	2,829	6,588	6,300	5,039
Sugar maple	121	115	124	306	280	261
Yellow birch	33	31	15	93	85	53
Basswood	204	194	297	451	400	833
Elm	283	267	353	702	650	1,167
Oak	440	504	770	762	1,080	1,932
Cottonwood-Aspen	1,588	1,514	1,862	2,367	1,630	1,927
Paper birch	549	520	416	783	505	405
Soft maple	47	44	45	111	100	104
Misc. hardwoods	209	204	524	292	220	817
All hardwoods	3,474	3,393	4,406	5,867	4,950	7,499
All Species	6,725	6,420	7,235	12,455	11,250	12,538

1/ Adjusted to conform to 1953 definitions

2/ Not estimated in board feet in 1936.

Table 16. - Comparison of estimates of all timber volume, 1936 and 1953 - Minnesota

(In million cubic feet)

Class of material	1936		1953
	Original figure	Adjusted figure	
Growing stock:			
Sawtimber trees:			
Sawlog portion	2,037	1,840	2,228
Upper stem	912 1/	400	518
Total	2/	2,240	2,746
Poletimber trees	3,776	4,180	4,489
Total growing stock	6,725	6,420	7,235
Other material:			
Cull trees	1,558	1,308	1,253
Cull in logs	178	160	2/
Hardwood limbs	1/	512	443
Salvable dead trees	2/	2/	8
Total other material	1,736	1,980	1,704
Total all timber	8,461	8,400	8,939

1/ Upper stem and limbs combined.

2/ Not estimated.

Table 17. - Comparison of 1936 and 1952 volume of timber cut from growing stock - Minnesota

(In million cubic feet)

Product	Material cut from growing stock	
	1936	1952
Sawlogs	27.9	36.4
Veneer logs	1.5	1.5
Cooperage bolts	.1	.0
Pulpwood	30.0	74.6
Fuelwood	36.0	29.8
Posts	6.5	5.0
Poles	1.2	1.4
Piling	.7	.2
Miscellaneous	6.3	5.3
All products	110.2	154.2

Table 18. - Comparison of 1936 and 1952 volume of timber cut by species groups - Minnesota

Species group	Cut of all growing stock		Cut of sawtimber	
	1936	1952	1936	1952
	Million cu. ft.		Million bd. ft.	
Softwoods	60.3	78.0	144.6	138.0
Hardwoods	49.9	76.2	78.5	123.8
All species	110.2	154.2	223.1	261.8

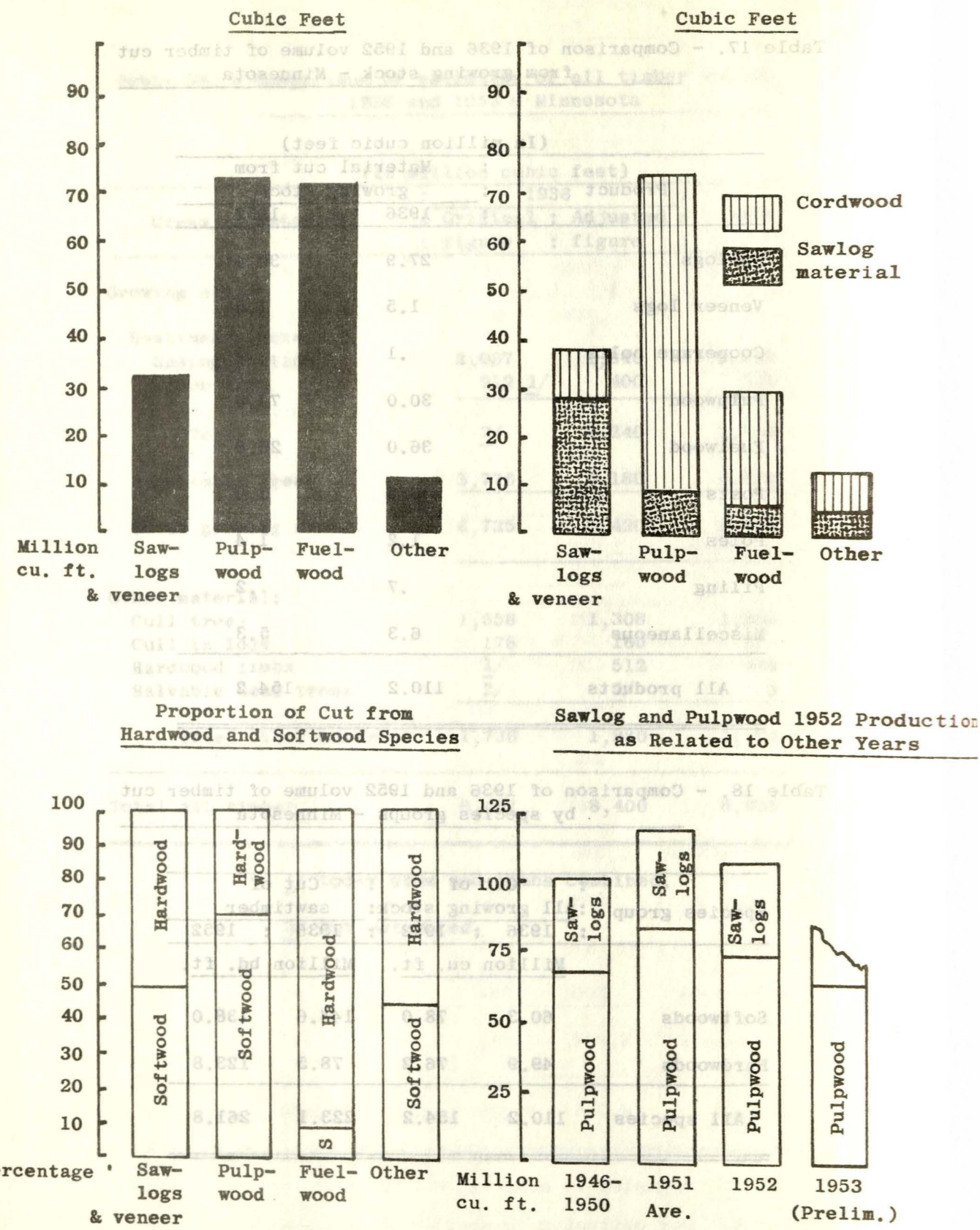


Figure 7. - Timber Cut - Minnesota, 1952

APPENDIX

Definitions of Terms

Forest Area

Forest land area. - Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked are excluded).

Commercial forest land area.- Forest land that is (a) producing, or physically capable of producing, useable crops of wood (usually sawtimber); (b) economically available now or prospectively; and (c) not withdrawn from timber utilization.

Noncommercial forest land area. - Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but that otherwise qualifies as commercial forest land; or (b) incapable of yielding useable wood products (usually sawtimber or pulpwood) because of adverse site conditions.

Forest Types

A forest type is characterized by the predominance of certain key species. Predominance means that in sawtimber stands 50 percent or more of the sawlog volume is of the key species; in poletimber stands, 50 percent or more of the cordwood volume; and on restocking areas, 50 percent or more of the small trees.

White pine type. - Pine species predominating with white pine the most common.

Red pine type. - Pine species predominating with red pine (Norway) the most common.

Jack pine type. - Pine species predominating with jack pine the most common.

Spruce type. - Swamp conifers predominating with black spruce the most common.

Tamarack type. - Swamp conifers predominating with tamarack the most common.

Cedar type. - Swamp conifers predominating with cedar the most common.

Spruce-fir type. - A mixed hardwood-coniferous stand with white spruce and balsam fir the most common species.

Northern hardwood type. - A stand in which northern hardwood species (sugar maple, yellow birch, and basswood) are predominating. May be subtyped red maple if that species is the most common.

Bottomland hardwood type. - A stand in which bottomland hardwood species (ash, elm, and balm-of-Gilead) are predominating.

Oak. - A stand in which the oak species predominates. May be subtyped scrub oak if the type is capable of producing only fuelwood material.

Aspen-birch type (often called the aspen type). - A stand in which trembling or large-tooth aspen and paper birch predominate. May be subtyped as paper birch if white birch is most common or as "off-site" aspen if the type is not capable of producing sound merchantable pulpwood.

Stand-Size Classes

Sawtimber stands. - Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International 1/4-inch rule. (In 1936, the minimum sawtimber stand had 2,000 board feet, Scribner Dec. C rule.)

Poletimber stands. - Stands that fail to meet the sawtimber stand specification, but are at least 10 percent stocked with poletimber and larger (5.0 inches and larger) trees, and with at least half the minimum volume in poletimber trees. (Poletimber stands carry at least 240 cubic feet per acre.)

Seedling-and-Sapling stands. - Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Other areas. - Forest land areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands. (Includes nonstocked areas.)

Tree Classes

Sawtimber trees. - Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and which are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. Merchantable sawlogs are at least 8.0 inches in diameter inside bark at the small end; from 8 to 16 feet in length; and suitable for sawing into standard lumber, construction timbers, or ties. In 1936, 10-inch hardwoods were included in sawtimber if they contained a 16-foot No. 3 log or an 8-foot No. 2 log. Softwoods and aspen were estimated to a 6-inch top in 1936.

Poletimber trees. - Trees of commercial species which meet regional specifications of soundness and form, and are in the following d.b.h. range:

Softwoods - trees 5.0 to 8.9 inches

Hardwoods - trees 5.0 to 10.9 inches

(Such trees usually become sawtimber trees if left to grow.)

Cull trees. - Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Timber Volume

Growing stock. - Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Live sawtimber volume. - Net volume in board feet, International 1/4-inch rule, of live sawtimber trees.

Growth

Net annual growth. - The change in net volume of the growing stock on commercial forest land during a specified year.

Mortality

Annual mortality of growing stock. - The net cubic-foot volume removed from growing stock during a specified year through death from natural causes.

Timber Cut

Timber products. - The volume of timber products cut from growing stock and other sources.

Logging residues. - The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Land clearing and cultural operations residues from growing stock.- The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by land clearing in a specified year and not converted to timber products.

Allowable Cut

Allowable cut. - The volume of live sawtimber and poletimber that can be cut during a given period while building up or maintaining sufficient growing stock to meet specified growth goals.

Forest Survey Methods

Area

Three methods were used in the Forest Survey in Minnesota to collect the statistics on forest land areas.

Random block sampling. - In nearly all of the Survey Districts 1, 2, and 3, the area estimates were based upon either four 160-acre blocks or nine 40-acre blocks selected at random in each township. The type, size, and stocking classes were delineated and classified on aerial photos before being checked on the ground.

Dot-block sampling. - In District 4 and the northeastern portions of District 5, the dot-block method was used. The total forest area proportions were determined by counting and classifying as forest, nonforest, and water, mechanically spaced dots on alternate aerial photographs. At every sixth forested dot the legal 40-acre description in which the dot fell was used as a sample to break down the total forest land to type, size and stocking classes. On the aerial photographs of each of these 40's the type, size and stocking classes were delineated and classified and the forested dot was located. Every third 40 was ground checked to verify or change the classifications of the forested dot and the type, size and stocking classes. These ground checks were then used to adjust the data on the samples that were not ground checked.

Dot sampling. - In the thinly forested portions of District 5, the number of forest and nonforest dots counted and classified was increased. Every fourth forest dot was classified as to type, size, and stocking class and varying percentages were ground checked to reach a specified level of accuracy.

Volume and Growth

Volume and growth measurements were taken on 1/5-acre circular plots located on the ground-checked samples. The resulting volumes and growth per acre by type, size, and stocking classes were used with the area data to estimate total volumes and growth by species and diameter class.

Allowable Cut

On each plot the survey crew made an estimate of the volume that should be cut during the next cutting cycle, both for intermediate cuts in even-aged stands and intermediate and harvest cuts in uneven-aged stands. A flexible system of area and volume control was used to estimate the harvest cuts in mature even-aged stands.

Commodity Drain

All sawmills, pulp mills, veneer mills, and other wood-using industries were canvassed by mail or interview to get an estimate of the amount of wood produced as primary forest products. Other surveys were made to estimate the amount of fuelwood and fence post production. Studies were also made of timber residues to adjust the production by commodities to commodity drain in terms of inventory volumes. In addition, all public agencies were canvassed for the amount of wood sold during the drain year, and this information used to break the total drain down by ownership.

Accuracy of Estimates

There were two sources of error in estimating the error of forest land area: (1) Errors in classifying the type, size and stocking classes and in compiling the data, and (2) sampling errors. Frequent checks were made during the collection and compilation of the data, both in the field and in the office, to minimize the operational errors. The sampling intensity was sufficient to provide an estimate of the forest area with a standard sampling error of about 0.5 percent.

The sources of error in estimating timber volume include: (1) Errors in measurement of plot radius, tree diameter, height, and cull; (2) improper construction or use of tree volume tables; (3) errors in collecting or compiling the plot data; and (4) sampling errors. As in the area determinations, every effort was made to obtain accurate measurements and final statistics through frequent checks and training. The number of plots taken in the state was adequate to provide a sampling error for total cubic foot volume of not more than 1 percent, and a sampling error for total sawtimber volume of less than 1.5 percent. In all of the tables shown, the totals are more accurate than the subtotals, and the subtotals are more accurate than the individual items in the tables. Any item that is small in relation to the totals is subject to large sampling errors.